

Assessing the groundwater resources management in the Bac Lieu Province, Mekong delta, Vietnam

Đánh giá công tác quản lý nguồn tài nguyên nước dưới đất tại tỉnh Bạc Liêu, đồng bằng sông Cửu Long, Việt Nam

Research article

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The research aims to assess the current groundwater resources management in Bac Lieu province. The combination of descriptive statistic and interview approach (including individual interview and key informant panel) were applied based on the principles of water governance framework developed by the Organization of Economic Co-operation and Development (OECD) to assess the policy coherence and the transparency and stakeholder engagement of the groundwater management. The study showed that the current groundwater resources management improved overtime; however, the policies were not completely sufficient and the responsibility of the units related to the groundwater resources management was not indicated clearly yet. Thus, overlaps in function of different management units are found and the access of the local people to the groundwater management was limited. In addition, the stakeholder involvement in managing the groundwater resources was in short of both amount and qualification. The separation of powers seems to be higher and higher, the local government has the main responsibility to manage the groundwater and the communities, especially the local people still have low rate of participation in the groundwater resources management process.

Nghiên cứu được thực hiện nhằm đánh giá hiện trạng quản lý nguồn tài nguyên nước dưới đất (NDĐ) tại tỉnh Bạc Liêu. Sự kết hợp giữa phương pháp thống kê mô tả và phương pháp phỏng vấn (bao gồm phỏng vấn cá nhân và phỏng vấn chuyên gia) dựa trên những quy định về quản trị tài nguyên nước của Tổ chức Hợp tác và Phát triển Kinh tế (OECD – Organization for Economic Co-operation and Development) được áp dụng để đánh sự chặt chẽ của các chính sách quản lý, sự minh bạch của công tác quản lý và sự tham gia của các bên có liên quan. Kết quả cho thấy, cơ chế quản lý nguồn tài nguyên NDĐ đã và đang dần hoàn thiện, song các chính sách quản lý vẫn còn chưa đầy đủ và trách nhiệm của các đơn vị quản lý vẫn chưa được quy định rõ ràng. Vì vậy, đến nay công tác quản lý còn phát sinh sự chồng chéo và thiếu sự phối hợp giữa các cơ quan chức năng có liên quan cũng như sự liên kết giữa cơ quan quản lý địa phương và người sử dụng tài nguyên NDĐ. Thêm vào đó, các bên có liên quan tham gia vào quản lý nguồn tài nguyên NDĐ còn hạn chế về cả số lượng và năng lực, trong đó chính quyền địa phương là đơn vị quản lý chính; do vậy, sự tập trung quyền hạn vào một chủ thể (chính quyền địa phương) là rất cao và sự tham gia của cộng đồng, đặc biệt là người sử dụng NDĐ, còn hạn chế.

Keywords: groundwater, management, OECD, policy coherence, stakeholder engagement, transparency

1. Introduction

Water is one of the most essential sources supporting human-beings activities over the world and plays an important role for eco-social development and natural biological system balance (An *et al.*, 2014). The water, however, is an limited resources and vulnerable (Solanes *et al.*, 1999), so that an inefficient governance might lead to the appreciable impacts to human and environment development (Phan *et al.*, 2014). The sustainable governance on the water resources has been concerned in the recent years. For example, for better water management, Van Rijswijk *et al.* (2014) proposed a 10-building block framework to assess the water governance, which completely presented the necessary factors for the efficient water governance assessment. Besides, the Organization of Economic Co-operation and Development (OECD, 2015) also determined the basic principles supporting the water governance. The report indicated specific criteria for assessing each factor of the water governance. In addition, this tool was conducted by over 30 countries in the organization; therefore, the application of the principles might bring the high feasibility than some other principles. Specifically, the OECD principles on water governance was applied in different study areas on the world, e.g. the Netherlands or the Latin America.

Bac Lieu is a province located in the coastal area of the Vietnamese Mekong Delta (VMD) with favorable conditions for agricultural cultivation, leading to a high demand of water usages for different purposes (Bac Lieu Department of Natural resources and Environment, 2014). In the recent years, the rapid socio-economic development has created a great pressure for both surface water and groundwater resources. The demand of using water has been becoming increasingly, especially to supply for domestic use

and irrigate in agricultural activities (Bac Lieu Department of Natural resources and Environment, 2014). Recently, the water resources in this province has been affected by lots of complicated elements including: saline intrusion and surface water pollution, leading to over-extraction of the groundwater resources (Ridolfi, 2010) and caused the degradation of the scarce freshwater of the province (An *et al.*, 2014). Besides, some recent researches showed that the groundwater resources governance has been still had a large of difficulties (Phuc, 2008), the management has not been completed and low effectiveness (Trung, 2015).

Following these issues, this research was implemented to assess the current groundwater management in Bac Lieu province with some specific objectives: (1) to assess the coherence of the policies applied for the groundwater management; (2) to assess the transparency of the implementation and enforcement the groundwater management; and (3) to determine the stakeholders involvement in use and manage the groundwater resources.

2. Methodology

2.1. Data collecting

2.1.1. Secondary data

The primary data (Table 1) about the current groundwater resources extraction and use, the list of the policies and regulations applied to manage the groundwater resources and the data about licensing register for extracting the groundwater resources were collected from the scientific researches in terms of the final report from the Bac Lieu People Committee (PC) the Bac Lieu DONRE and Bac Lieu web portal from 2011 – 2016.

Table 1. Secondary data collection

Serial	Data	Year	Source
1	Natural conditions, eco-social conditions in Bac Lieu province	2015	The Bac Lieu PC
	Periodically monitoring data of water table and water quality	2015	
2	Licensing register for groundwater resources extraction	2016	Bac Lieu DONRE
	Policies and regulations applied for groundwater resources management		
3	Groundwater resources extraction long-term plan	2011	Bac Lieu DONRE

2.1.2. Primary data

Key informant panel and individual interview (90 people) were applied based on the available questionnaire to collect the data, including: the coherence of the managing policies, the transparency in managing the groundwater resources and the stakeholder involvement in managing the groundwater resources. The study area (Figure 1) and the amount of questionnaire were chosen depending on the criteria showed in Table 2. The questionnaire was conducted base on the OECD principles on water governance.

2.2. Data analysing

Descriptive statistic was applied to analyse both the primary and secondary data to assess the research objectives.

GIS tools was also applied to create some maps relating to the research implementation.

3. Results and discussions

3.1. The coherence of the groundwater resources management policies

Until 2016, the groundwater resources of the province were managed by these mechanisms: civil defence, technology and economic. In the one hand, these application was in short of integrated connection and the civil defence tool seemed to be much more applied to manage the groundwater resources than the others in the other hand.

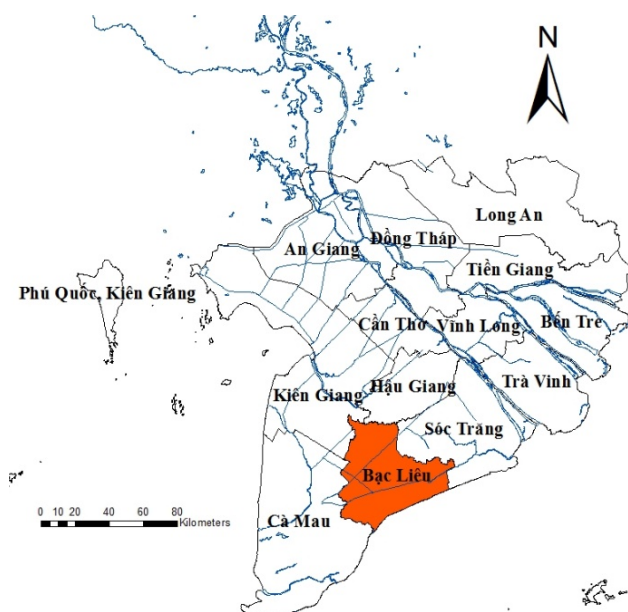


Figure 1. The study area

Table 2. The criteria for choosing the study and interviewing areas

Se- rial	Content	Criteria	Sample No.
1	Location	<ul style="list-style-type: none"> • Agricultural cultivation wards • Agri-Aquacultural combination wards • Agricultural cultivation wards • Trading activities ward 	80
2	Extracting purpose	<ul style="list-style-type: none"> • Domestic use • Agricultural irrigation • Aquacultural cultivation 	
3	Staffs	<ul style="list-style-type: none"> • The Bac Lieu PC • The Bac Lieu DONRE • The Bac Lieu water supply company 	05 03 02

Until 2016, the Bac Lieu People Committee (PC) deployed and applied the documents promulgated by the central government, instead of the Law of Water Resources, the Decrees promulgated by the Vietnamese government and the Circular/Standards promulgated by the Vietnamese Ministries of Natural Resources and Environment (MONRE), e.g. as the Decree named 29/2011/NĐ-CP entitled “*Regulating about strategic environmental assessment, environmental impacts assessment and environmental protection arrangement*” which was also concretized in the Circular named 26/2011/TT-BTNMT enacting by Vietnamese MONRE entitled “*Specifically regulating of some provisions in the Decree named 29/2011/NĐ-CP on 18th April 2011 by Vietnamese Government about environmental assessment, environmental impacts assessment and environmental protection arrangement*”. Besides, to protect the water resources in the province, the Bac Lieu PC promulgated quite some regulations about the water resources management which have been deployed to the government,

non-government organizations and the local people by the Bac Lieu DONRE. Specifically, the Bac Lieu PC promulgated the Designation No. 01 named “*Enhancing the management on groundwater resources extraction and drilling*”. Based on the policies promulgated by the central government and the Designation No. 01, the Bac Lieu PC implemented some short-term plans and long-term plans to manage the water resources, e.g. the Bac Lieu PC implemented the long-term plans named “*Long-term plan for the groundwater resources management on extraction and use in Bac Lieu province up to 2020, a vision to 2030*”.

Technical and economical tools are also applied to manage the groundwater resources in the province also. About the economical aspect, the Bac Lieu DONRE deployed to collect the groundwater extraction fee, the groundwater extraction licensing register fee depending on the Circular named 27/2014/TT-BTNMT entitled “*Regulating on the groundwater extraction register, profile form for licensing, adjourning and reauthorizing water extraction license*” to get the state of groundwater exploitation in the whole province. For the technique aspects, the provincial DONRE deployed to monitor the dynamic of the groundwater resources in terms of quality and quantity. Specifically, the Bac Lieu DONRE set 4 different stations to monitor at 4 different groundwater aquifers. In general, the monitoring results showed that the water table at all monitoring aquifers is degraded annual year, especially is the seriously degradation about 0.5m per year of the water table at the Pleistocene upper – middle aquifer, at which was as known as the most extracted aquifer in the province. However, monitoring activities focused on water table factor and water table results was reported periodically once a month while water quality factor was monitored and reported by season (twice a year). Therefore, we could say that the water table factor is much more affected to extraction and use. Simultaneously, the groundwater quality in the province is quite stable and few of changes while water table factor has been more and more decreased. Thus, the groundwater resources management on technique basis has primarily focused on the quantity aspects.

3.2. The transparency in the groundwater resources management

There was about 90% of the local people self-extracting the groundwater resources who didn't register for the groundwater exploitation license and only 6.3% people had the information about the groundwater extraction license registration. However, following the staffs in the provincial DONRE, the local people were requested for the extraction license and this information was transmitted to the functional agencies, including the District/Commune People Committee and the district DONRE in the specific locations. Hence, the data which the managing agencies were using about the licensing register for groundwater resources extraction might not be updated regularly and might not be high accuracy also. This could be a huge limitation for implementing the managing solutions because of not having the realistic state about the groundwater extraction in the province.

To extract effectively the groundwater resources, the access to the policies relating to the groundwater resources

management is necessary. However, the direct interview showed that there were 32,1% people who knew about licensing register to get the permission to extract the groundwater, 28,6% people knew about the drilling wells principles and 66,1% people didn't know any managing policies on the groundwater resources. In addition, 85,7% users confirmed that they didn't have any information about the policies supporting groundwater users, 10,7% of the interviewed people didn't concern about these policies and the rest one knew about the supporting policy which is a Decree of the Vietnamese Government named 54/2015/TT-CP entitled "Regulating about support for saving and effective use of water resources".

However, the interviewing results from the staffs in the Bac Lieu DONRE also showed that the deployment of the information relating to the groundwater users was implemented in a diversity way in both forms and content. The provincial DONRE combined with the local TV to conduct a recording to discuss about the environmental issues in the province annual month; the provincial DONRE was also periodically conducting the newsletter about the natural resources and environment to transmit the information to the lower agencies and the local people. Moreover, the local radio stations made the integrated programmes combining with the managing information and played everyday to propaganda to the local people in order to raise the groundwater users awareness about the effective use.

Thereout, 100% of interviewed people considered that there has never been any verification about the extraction of the groundwater users by any individual or organization. The interviewing results from the staffs in the Bac Lieu DONRE, however, showed that the inspection about the exploitation of the groundwater users was periodically done in the province. From this baseline, we are able to confirm that the current extraction and use of the groundwater users has not been completely managed, leading to the inaccurate data and might cause some difficulties for the groundwater resources management.

Other way, the checking and inspectoral process of the groundwater extraction was implemented seriously and systematically based on the Circular named 56/2014/TT-BTNMT promulgating by the Vietnamese MONRE entitled "Regulating about capability of responsible organizations, individuals implementing water resources basic investigation, water resources planning creation advisory, proposal and report creation to get water resources license". In addition, the Bac Lieu DONRE combined with the provincial police and local managing units including the district DONRE and people committee in district/commune level to make a committee for checking the groundwater users about their observance of the groundwater resources regulations. In the situation of detecting violations in extracting and using the groundwater resources, this committee will solve in the basis of the Decree named 42/2013/TT-CP entitled "Regulating about financial sanction in the fields of minerals and water resources". Moreover, with the advisory of the provincial DONRE to the Bac Lieu PC annual year about the setting plans and planings creation to manage the groundwater resources. However, the concern about risks to the groundwater resources still had limitation. This could be the reason of risky prevention activities has not been fully and closely implemented. Besides, up to now, the problem that make difficulty to the groundwater resources management is the sort of unification between extracted and managed elements.

3.3. Stakeholders involvement in the groundwater resources management

The participants taking part in the managing process were diverse and had the specific function also. There were three group of participants, including the local government, the groundwater users and the scientists. Moreover, each group had their own role in the managing process. Table 3 showed the subjects participating in use and extracting process.

Table 3 The stakeholders in extracting and managing the groundwater resources

Serial	Subjects			Function
1	Local government	PC	Province	Host, plan and promulgate the groundwater resources policies/regulations
			District/Commune	Deploy the groundwater resources policies/regulations in their specific locations
		Managing agencies	Provincial DONRE	Responsible agency for managing the groundwater resources, advising for the provincial PC in determining and promulgating groundwater resources strategies and policies
			Another units	Authorized by the province PC in combining with the provincial DONRE in deploying and enforcing the groundwater resources strategies and policies
2	Users	Water supply company		Deploy the groundwater resources strategies and policies and making periodically report about the extraction of the company and the local people use
3		Local people		Observe the groundwater resources strategies and policies
4	Scientists			Research the groundwater resources state and dynamics, timely supply the scientific information Analyze and make risky forecast in terms of suggest some suitable solutions for the groundwater

Besides, each participant took part in the managing process with a different level. Figure 2 reflected the rate of participation of each participant in the groundwater resources management process.

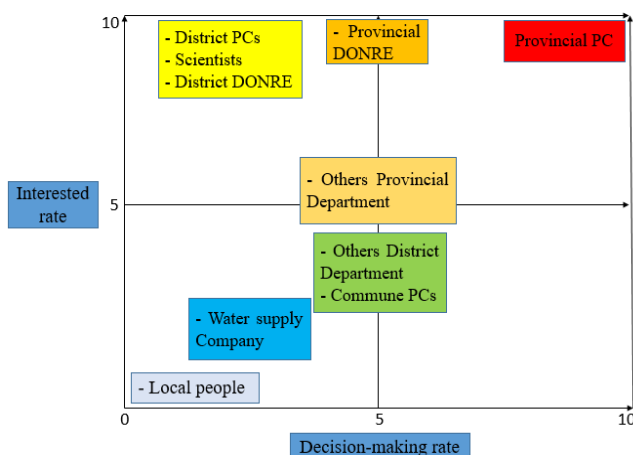


Figure 2. Participatory rate of the stakeholders in the groundwater resources management

Thus, the results showed that the main participant joining in the groundwater resources process in terms of decision-making rate and interested rate is the local government. Specifically, the provincial PC participated in the managing process as the highest rate. Next is the main responsible agencies relating to the groundwater resources management, including the provincial DONRE, the scientists and the district/commune PC. Another provincial and district department is responsible to combine with the DONRE to enforce the management, so that they joined in the managing process with the average rate. The communities group including the water supply company and the local people who directly impacted to the groundwater resources are quite low responsibility in making decision in terms of interesting in the groundwater resources management, leading to their smallest participation in the managing process.

4. Conclusion

The managing mechanism has been applied several tools, but these tools have not been integrated use together. Besides, there is still in short of the policies supporting for the groundwater management.

The groundwater resources management has been improving. However, the combination between the main agency and the others and the local people also has still had limitation, leading to the low transparency of the groundwater resources management.

The stakeholder involvement in the groundwater resources management process has been limited in both amount and qualification. The sporadic participation and the separation of powers seem to be higher and higher. Specifically, the managing function is focus on the local government and the role of the groundwater users is very low, leading to inefficient extraction and management.

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